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TRANSACTIONS
OF THE
KANSAS
ACADEMY OF SCIENCE

VOLUME XXVII

CONTAINS
A LIST OF OFFICERS AND PAST PRESIDENTS; MEMBERSHIP
LIST JANUARY 1, 1915; MINUTES OF FORTY-SEVENTH
ANNUAL MEETING; PRESIDENT'S ADDRESS;
SOME PAPERS READ.

DECEMBER 22 AND 23, 1914

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PAST PRESIDENTS.

1869, '70.... B. F. Mudge.	1897..... S. W. Williston.
1871- '73.... John Fraser.	1898..... D. E. Lantz.
1874- '78.... F. H. Snow.	1899..... E. B. Knerr.
1879, '80.... B. F. Mudge.	1900..... A. S. Hitchcock.
1881, '82.... J. T. Lovewell.	1901..... E. Miller.
1883..... A. H. Thompson.	1902..... J. T. Willard.
1884, '85.... R. J. Brown.	1903..... J. C. Cooper.
1886..... E. L. Nichols.	1904..... Edward Bartow.
1887..... J. D. Parker.	1905..... L. C. Wooster.
1888..... J. R. Mead.	1906..... F. O. Marvin.
1899..... T. H. Dinsmore, jr.	1907..... J. A. Yates.
1890..... G. H. Failyer.	1908..... E. Haworth.
1891..... Robert Hay.	1909, '10.... F. B. Dains.
1892..... E. A. Popenoe.	1911..... J. M. McWharf.
1893..... E. H. S. Bailey.	1912..... F. W. Bushong.
1894..... L. E. Sayre.	1913..... A. J. Smith.
1895..... Warren Knaus.	1914..... W. A. Harshbarger.
1896..... D. S. Kelly.	1915..... J. A. G. Shirk.

OFFICERS OF THE ACADEMY, 1915.

<i>President</i> , J. A. G. SHIRK.....	Topeka.
<i>Vice President</i> , J. E. TODD.....	Lawrence.
<i>Vice President</i> , F. G. AGRELIUS.....	Emporia.
<i>Treasurer</i> , L. D. HAVENHILL.....	Lawrence.
<i>Secretary</i> , J. T. LOVEWELL.....	Topeka.

EXECUTIVE COUNCIL.

Ex officio the PRESIDENT, TREASURER and SECRETARY.

Elective for 1915.

W. A. HARSHBARGER.	L. C. WOOSTER.
J. A. YATES.	J. T. WILLARD.

MEMBERSHIP OF THE ACADEMY.

January 1, 1914.

Dates signify date of election to membership in the Academy.

HONORARY MEMBERS.

- G. P. Grimsley, Ph. D., 1904, Martinsburg, W. Va.
 Edw. L. Nichols, Ph. D., 1897, Cornell Univ., Ithaca, N. Y.
 W. S. Franklin, Sc. D., Lehigh Univ., South Bethlehem, Pa.
 Geo. Wagner, Ph. D., 1904, Univ. of Wisconsin, Madison, Wis.
 S. W. Williston, A. M., M. D., Ph. D., 1902, professor of paleontology,
 Univ. of Chicago, Chicago, Ill.

ASSOCIATE MEMBER.

Mrs. R. J. Brown, 1903, Leavenworth.

LIFE MEMBERS.

- E. H. S. Bailey, Ph. D., 1883, Univ. of Kansas, Lawrence.
Edward Bartow, Ph. D., 1898, director of water survey, Urbana, Ill.
Joshua William Beede, Ph. D., 1894, associate professor of geology, Bloomington, Ind.
F. W. Bushong, Sc. D., 1896, Mellon Institute, Univ. of Pittsburg, Pa.
F. W. Cragin, Ph. D., 1880, economic, geologic and historical research, Colorado Springs, Colo.
Lewis Lindsay Dyche,* M. S., 1881, professor of systematic zoölogy and curator of birds, mammals and fishes, state fish and game warden, Univ. of Kansas, Lawrence.
Geo. H. Failyer, M. Sc., 1879, Manhattan.
E. C. Franklin, Ph. D., 1884, Stanford Univ., Palo Alto, Cal.
I. D. Graham, 1879, Live Stock Com., Panama Ex., San Francisco, Cal.
Wm. Ashbrook Harshbarger, B. S., 1900, professor of mathematics, Washburn Coll., Topeka.
Erasmus Haworth, Ph. D., 1882, state geologist, Univ. of Kansas, Lawrence.
Warren Knaus, M. Sc., 1884, entomologist, editor and publisher, McPherson.
D. E. Lantz, M. Sc., 1887, biological survey, Washington, D. C.
J. T. Lovewell, Ph. D., 1878, chemist, Topeka.
F. O. Marvin, A. M., 1884, Univ. of Kansas, Lawrence.
Ephraim Miller, A. B., A. M., Ph. D., 1873, Pasadena, Cal.
L. E. Sayre, Ph. M., 1885, Univ. of Kansas, Lawrence.
Alva J. Smith, 1903, city engineer, Emporia.
Mrs. L. C. R. Smyth, M. S., Ph. D., 1902, curator of Goss Orinithological Collection, Topeka.
E. G. Smyth, 1901, entomology, Santa Rita, P. R.
C. H. Sternberg, 1896, explorer and collector, Lawrence.
M. L. Ward, D. D., 1880, Ottawa Univ., Ottawa.
J. T. Willard, M. S., 1883, Kansas Agr. Coll., Manhattan.
L. C. Wooster, 1899, Ph. D., professor of geology, Normal School, Emporia.
J. A. Yates, 1897, professor of geology, Normal School, Emporia.

ANNUAL MEMBERS.

- Frank G. Agrelius, A. M., 1905, State Normal School, Emporia.
Bennet M. Allen, 1913, professor of zoölogy, Lawrence.
H. C. Allen, 1904, University of Kansas, Lawrence.
Agnes Anderson, 1913, chemist.
John J. Arthur, 1904, Topeka.
Wm. R. Arthur, B. A., 1903, dean of law school, Washburn Coll., Topeka.
Elam Bartholemew, M. S., 1905, mycologist, Stockton.
W. J. Baumgartner, 1904, professor of zoölogy and histology, Univ. of Kansas, Lawrence.
Frank G. Bedell, 1904, Dodge City.

* Deceased.

- F. H. Billings, Ph. D., 1909, Univ. of Kansas, Lawrence.
 H. H. Braucher, 1907, teacher, K. S. N., Emporia.
 Frank P. Brock, 1911, Ind. research, Univ. of Kansas, Lawrence.
 E. W. Brown, B. S., 1909, Chehalis, Wash.
 F. W. Bruckmiller, 1914, chemist state water survey, Lawrence.
 L. D. Bushnell, 1909, professor of bacteriology, Agr. Coll., Manhattan.
 H. P. Cady, Ph. D., 1904, professor chemistry, Univ. of Kansas, Lawrence.
 M. E. Canty, 1903, Fredonia.
 I. D. Cardiff, Ph. D., 1909, professor of botany, State Agr. Coll., Pullman, Wash.
 V. B. Caris, 1911, professor mathematics, M. T. S., Pittsburg.
 W. R. Cleveland, 1914, superintendent of schools, Mulberry.
 L. J. Congdon, 1914, assistant food inspector, Board of Health, Topeka.
 W. A. Cook, M. S., 1907, Baker Univ., Baldwin.
 R. A. Cooley, 1910, Agr. Expt. Station, Bozeman, Mont.
 Rev. John T. Copley, 1903, Oak Hill.
 Margaret Coventry, 1914, professor of chemistry, Pittsburg.
 F. F. Crevecoeur, 1899, entomologist, Onaga.
 S. J. Crumbine, M. D., 1909, secretary State Board of Health, Topeka.
 Frank Burnett Dains, Ph. D., 1902, professor of chemistry, Univ. of Kansas, Lawrence.
 B. J. Dalton, C. E., 1909, Univ. of Kansas, Lawrence.
 Geo. A. Dean, M. S., 1912, professor of entomology, Manhattan.
 O. P. Dellinger, professor of biology, M. T. S., Pittsburg.
 S. A. Deel, 1913, professor of physics, Baker Univ., Baldwin.
 Emil O. Deere, 1905, Bethany Coll., Lindsborg.
 Herman Douthitt, 1914, assistant professor of zoölogy and paleontology, Lawrence.
 R. B. Dunlevy, M. A., 1896, S. W. Kansas Coll., Winfield.
 J. W. Eby, 1903, banker, Harvard.
 C. W. Edmondson, Ph. D., 1909, professor of geology and histology, Eugene, Ore.
 H. W. Emerson, B. S., 1904, Univ. of Kansas, Lawrence.
 T. L. Eyerly, 1906, high school, department of physiography, Dallas, Tex.
 Fred. Faragher, A. B., 1904, with Alden Spear's Sons Co., Chicago, Ill.
 A. O. Garrett, 1901, teacher high school, Salt Lake City, Utah.
 A. A. Graham, 1910, lawyer, Topeka.
 O. S. Groner, Sc. M., 1907, professor of chemistry, Ottawa Univ., Ottawa.
 Mary Herman, Ph. D., 1912, Agr. Coll., Manhattan.
 H. J. Harnly, B. S., 1903, professor, McPherson Coll., McPherson.
 L. D. Havenhill, D. Phar., 1904, professor of pharmaceutical chemistry, Univ. of Kansas, Lawrence.
 Thomas J. Headlee, Ph. D., 1907, professor of zoölogy and entomology, Rutgers Coll., New Brunswick, N. J.
 D. A. Horton, 1913, entomologist, McPherson.
 W. F. Hoyt, A. M., 1902, State Normal School, Neb.
 Leroy Hughbanks, 1914, minister and lecturer, Anthony.
 I. W. Humphrey, 1912, Mellon Institute, Univ. of Pittsburg, Pa.
 Thomas M. Iden, 1897, State Normal School, Emporia.

- H. Louis Jackson, B. S., 1909, state food analyst, Univ. of Kansas, Lawrence.
- A. W. Jones, 1914, professor of geology, Wesleyan Coll., Salina.
- W. H. Keller, 1898, high school, Emporia.
- H. H. King, A. B., A. M., 1909, assistant professor of chemistry, Agr. Coll., Manhattan.
- Leslie A. Kenoyer, 1906, Toledo, Ia.
- Harry L. Kent, 1904, nature study, Agr. Coll., Manhattan.
- John H. Klopfer, 1904, collector and mining expert, Topeka.
- W. S. Long, 1913, food laboratory chemist, Lawrence.
- Marcus A. Low, 1906, attorney C. R. I. & P. railway, Topeka.
- L. A. Lowther, 1907, superintendent of schools, Emporia.
- J. W. McCulloch, 1911, field agent, Agr. Coll., Manhattan.
- David F. McFarland, Ph. D., State Univ., Urbana, Ill.
- J. M. McWharf, M. D., 1902, physician, Ottawa.
- R. Matthews, D. D. S., 1898, dental surgery, Wichita.
- Grace R. Meeker, 1899, botanist, Ottawa.
- B. W. Merwin, 1914, field work in archæology, Savonburg.
- C. F. Menninger, M. D., 1903, physician, Topeka.
- S. T. Millard, M. D., 1909, physician and surgeon, Topeka.
- U. G. Mitchell, 1914, associate professor of mathematics, Lawrence.
- Robert Mohler, A. B., 1914, teacher, McPherson.
- W. L. Moodie, 1906, State Normal, Bellingham, Wash.
- Roy L. Moodie, Ph. D., 1909, instructor, Baylor Univ., Dallas, Tex.
- Merle M. Moore, 1909, student, Ottawa Univ., Ottawa.
- Celia Mulvehill, A. B., 1911, high school, Pittsburg.
- R. K. Nabour, 1910, instructor in zoölogy, Agr. Coll., Manhattan.
- C. F. Nelson, 1914, associate professor of physiological chemistry, Lawrence.
- T. L. Eyerly, 1906, high school, department of physiography, Dallas, Tex.
- Fred. Faragher, A. B., 1904, with Alden Spear's Sons Co., Chicago, Ill.
- A. O. Garrett, 1901, teacher high school, Salt Lake City, Utah.
- Leslie F. Paull, B. S., 1903, Agr. Coll., Fort Collins, Neb.
- Rev. P. B. Peabody, 1909, clergyman (ornithologist), Blue Rapids.
- L. M. Peace, A. B., 1904, Univ. of Kansas, Lawrence.
- Edison Pettit, 1914, assistant in physics, Washburn Coll., Topeka.
- L. M. Plairs, asst. entomologist, Agr. Coll., Manhattan.
- L. M. Powell, M. D., 1906, physician, Topeka.
- Silas Eber Price, D. D., president Ottawa Univ., Ottawa.
- Charles Smith Prosser, D. Sec., Ph. D., 1892, educator and geologist, Columbus, Ohio.
- Wm. S. Prout, M. D., 1904, Emmet, Kan.
- D. L. Randall, Ph. D., 1911, professor of chemistry, Baldwin.
- Albert B. Reagan, 1904, director of Indian school, Orr, Minn.
- S. L. Redman, 1914, professor of physics, Manual Training Normal, Pittsburg.
- L. J. Reiser, 1911, chemist, Topeka.
- Geo. E. Rex, 1911, mgr. treating plants, A. T. & S. F. Rly., Topeka.
- H. A. Rice, C. E., 1909, assistant professor of engineering, Univ. of Kansas, Lawrence.

- J. Risser, 1913, professor of zoölogy, Washburn Coll., Topeka.
 Eulalia E. Roseberry, 1909, teacher of physiography, Pittsburg.
 J. C. Russell, 1911, professor of agricultural chemistry, Univ. of Minnesota, Minneapolis, Minn.
 Frank K. Sanders, D. D., Ph. D., LL. D., 1909, president Washburn Coll., Topeka.
 D. C. Schaffner, 1903, Coll. of Emporia, Emporia.
 John H. Schaffner, A. M., M. S., 1902, professor of botany, Univ. of Ohio, Columbus, Ohio.
 Theo. S. Scheffer, M. S., 1903, Dept. Agriculture, Washington, D. C.
 B. W. Scheib, 1914, professor of agriculture, Manual Training Normal, Pittsburg.
 M. M. Schmidt, 1914, insurance and student, Home City.
 J. W. Scott, Ph. D., Agr. Coll., Manhattan.
 M. Sebastian, 1911, Parochial School, Parsons.
 Edwin Taylor Shelly, M. D., 1902, physician, Atchison.
 Claude J. Shirk, A. M., M. S., 1905, instructor in physics and chemistry, Ottawa.
 J. A. G. Shirk, 1904, professor of physics, Pittsburg.
 Ralph C. Shuey, 1905, Univ. of Pittsburg, Pa.
 S. G. Stewart, M. D., 1904, physician and surgeon, Topeka.
 Chas. M. Sterling, A. B., 1904, Univ. of Kansas, Lawrence.
 Frank Strong, LL. D., Ph. D., 1905, chancellor of University, Lawrence.
 E. F. Stimpson, 1904, Univ. of Kansas, Lawrence.
 M. C. Tanquary, Ph. D., 1912, instructor of entomology, Agr. Coll., Manhattan.
 E. L. Tague, A. M., professor of chemistry, Washburn Coll., Topeka.
 Edgar H. Thomas, 1907, State Normal School, Emporia.
 George W. Tidd, 1914, professor of physics, Emporia.
 J. E. Todd, A. M., 1907, professor of geology, Univ. of Kansas, Lawrence.
 David Train, 1907, Bethany Coll., Lindsborg.
 E. S. Tucker, 1904, associate professor of entomology, Dept. Agriculture, Baton Rouge, La.
 W. H. Twenhofel, 1910, professor of geology and paleontology, Univ. of Kansas, Lawrence.
 Edith M. Twiss, Ph. D., 1910, professor of botany, Washburn Coll., Topeka.
 Henry L. Viereck, 1913, entomologist, Lawrence.
 P. F. Walker, 1905, Univ. of Kansas, Lawrence.
 J. D. Walters, M. S., 1894, Agr. Coll., Manhattan.
 Laurance A. Walworth, 1913, taxidermist, Baldwin.
 E. C. Warfel, A. M., 1909, lawyer, Topeka.
 H. J. Waters, B. Sc., 1909, president Agr. Coll., Manhattan.
 E. R. Weidlein, 1911, Univ. of Pittsburg, Pa.
 J. E. Welin, A. M., M. S., 1899, professor of chemistry, Bethany Coll., Lindsborg.
 Ella Weeks, 1903, Agricultural College, Manhattan.
 J. B. Whelan, 1909, professor of chemistry, Univ. of Kansas, Lawrence.
 E. A. White, 1909, chemist, Kansas City, Mo.

Stanley D. Wilson, B. A., 1910, instructor in chemistry, Univ. of Chicago, Chicago, Ill.

W. B. Wilson, B. S., M. S., 1903, professor of biology, Ottawa Univ. Ottawa.

C. H. Withington, B. S., 1903, Greeley, Colo.

T. M. Wood, B. S., 1909, instructor, M. T. S., Pittsburg.

H. I. Woods, M. S., 1902, professor physics and astronomy, Washburn Coll., Topeka.

II.

MATHEMATICAL AND GEOLOGICAL PAPERS.

1. "A PROBABLE ORIGIN OF THE RINGS OF SATURN."
By ALBERT B. REAGAN.
2. "THE MARINE TERTIARY STRATIGRAPHY OF THE NORTH PACIFIC COAST
OF NORTH AMERICA."—A REVIEW.
By ALBERT B. REAGAN.
3. "DEEP WELLS AT ELMDALE."
By ALVA J. SMITH.
4. "KAW VALLEY ANTICLINE."
By E. C. WARFEL.
5. "THE CHERT GRAVELS OF EASTERN KANSAS."
By L. C. WOOSTER.

III.

PHYSICAL AND CHEMICAL PAPERS.

1. "MEASUREMENT OF THE INTERNAL FORCES OF SEEDS."
By CHARLES A. SHULL.
2. "HEATING VALUES OF NATURAL GASES OF THE MIDCONTINENTAL FIELD."
By H. C. ALLEN.
3. "CORN OIL."
By L. E. SAYRE.
4. "MUNICIPAL ILLUMINATION."
By J. A. G. SHIRK.
5. "A STUDY OF THE GELATINIZING AGENTS, PASTY MATERIALS AND THICKENERS USED IN FOOD PRODUCTS."
By LEON A. CONGDON.
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7. "THE DETERMINATION OF SULPHATES IN WATER."
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8. "THE QUANTITATIVE SEPARATION OF QUININE AND STRYCHNINE."
By G. N. WATSON.
9. "THE COMPOSITION AND PROPERTIES OF THE YUCCA PLANT."
By O. A. BEATH.
10. "MUSCALE BUTTONS."
By L. E. SAYRE and A. E. STEVENSON.
11. "PRUNELLA VULGARIS."
By L. E. SAYRE.
12. "CULTIVATION OF MEDICINAL PLANTS IN THE UNITED STATES."
By L. E. SAYRE.

IV.

MISCELLANEOUS PAPERS.

1. "ONE OF THE FIRST MILLSTONES."
By A. A. GRAHAM.
2. "AMERICA'S OPPORTUNITY IN SCIENCE."
By GEORGE W. TIDD.
3. "MALIGNANT TUMORS."
By J. M. McWHARF.
4. "A CONVENIENT CARD CATALOGUE OF FOOD ADULTERANTS."
By E. H. S. BAILEY.
5. "SOME EXPERIMENTS WITH THE MASON FRUIT JAR."
By AGNES ANDERSON MURRAY.

V.

APPENDIX.

1. NECROLOGY.—FRANK OLIN MARVIN.
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